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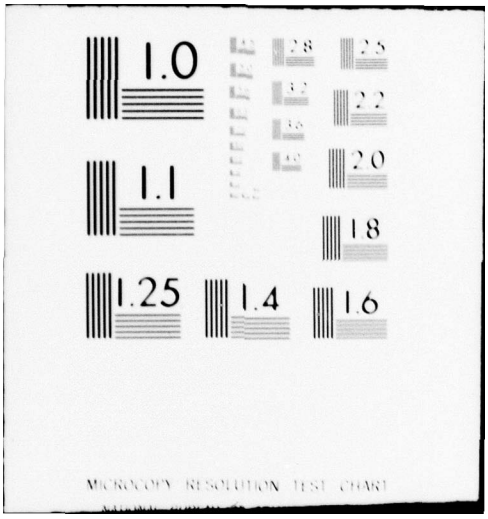
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FOREIGN TECHNOLOGY DIVISION

COMPUTER APPLICATION IN FLIGHT CONTROL FOR IDENTIFYING AND ELIMINATING POSSIBLE CONFLICTS

by

M. Gledec

EDITED TRANSLATION

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COMPUTER APPLICATION IN FLIGHT CONTROL FOR AND ELIMINATING POSSIBLE CONFLICTS

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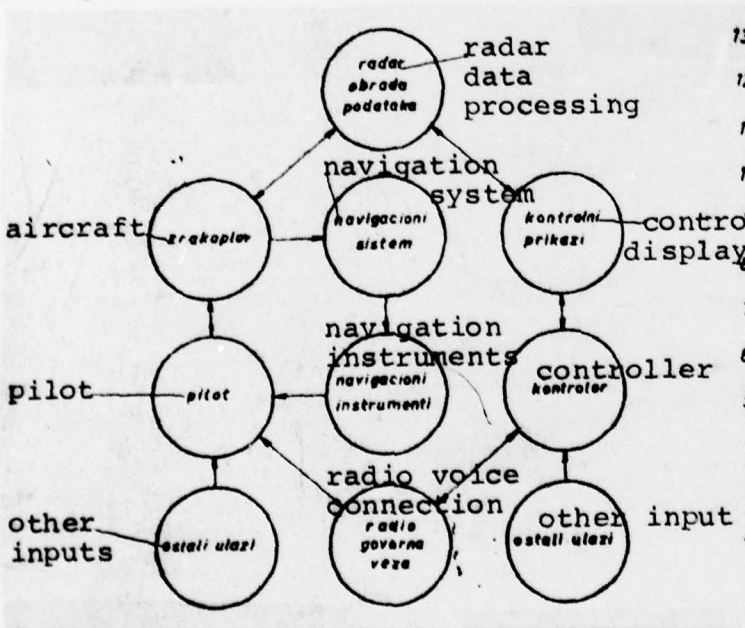
Maintenance of safe air traffic is task of organized control flight units. The job is done by the flight controllers who use their "implicit" working structure to process input information and issue sertain information. Figure 1,[1] gives relationships between pilot, controller and equipment during the guidance of the aircraft.

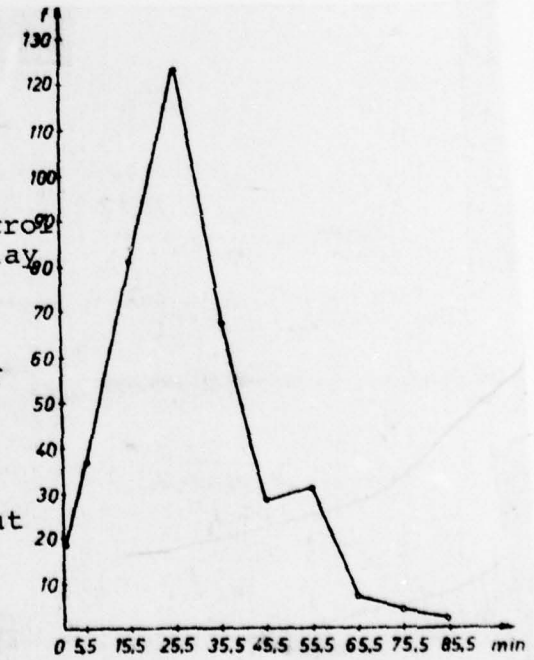
In the sector of regional control, the controller has the following data sources:

- radar
- radiocommunication with pilot
- phone connection with the other control departments
-his own activity
- strips.

Controller receives the basic information about an aircraft via the strips.



F.1. - "Control" loop and its elements in the guidance process



F.2. - "Preceeding time" distribution /interval between strip receiving and first aircraft identification/. The abscissa: Preceeding time; the ordinate: data frequency for each class.

The strip of an announced aircraft contains expected time and altitude just above the radiotransmitters. FIO sevice teletyps and broadcasts the flight plan to the all interested regional controls from starting airport. The strip is made on the flight plan base.

The strip is receiving before the first identifications made by the pilot of the aircraft. The precedeing time is not constant rather varying in wide range; fig.2,[2].

During the precedeing intervals, the contoller does analysis and planning of the future traffic situations and predicts commands for avoiding potential conflicts.

In the case of smaller preceding time, the controller must complete /perform/ the required tasks, but the amount of time available must not affect the occuracy of the overall operation.

Traffic situation analysis and determination of all potential conflicts are the most important operations in the aircraft guidance.

Therefore, the high occuracy of operation is required each instant of time.

The number of the aircraft supervised by the controller in a time unit is not constant; it varies during a day, a week, a month, etc.

Obviously, the greater the number of guided aircraft, the greater the possibility of conflicts which result in overloading of the available controller capacity.

If intesive traffic conditions / a great number of flights simultaneously guided/ and receiving of strips with short preseiding time occur at the same time, controller's ability to handle such a situation is severely reduced. Next the problem arises:

How is it possible to unburden the human-operator in the process of identifying possible conflict situations?

Because of its insensitivity to burdering conditions, the computer represents an idea for solution.

The controller guides the aircraft which fly within the predefined flight paths. The aircraft over the same radioemitter fly at the various attitudes and at vorious times preserving the prescribed separating minimums. (For aircraft at the same time attitude and the some path, separating minimum is 15 min.).

The determination of potential conflicts among aircrafts flying at the same attitude on the same path reduces to the determination of the prescribed instances of flight over the radioemitters for given separating minimum (15 minutes).

With the data about forecasted times of flights over the radoemitters, one can easily form a matrix. The guided aircraft represent the rows and attitudes represent the

Determination of differences among the elements of a matrix can be easily done by the computer. Besides, it is important to maintain man-machine interaction. Such interaction
is necessary to determine and avoid potential conflicts an unburden the contoller.

Such a connection is easy to implement in a time-sharing system. For the identification of potential conflicts the software package is bulit in tha BASIC language and the simulation experiment took place in Multimedia center at Zagreb University.

For the sake of simplisity, only one radioemitter is treated and avoidance of possible conflicts is done by varying the altitudes of the collideing aircraft.

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During the simulation experiment, operator had a task to numerate the strips according to the times of their being received. As a reaction to the data read, the computer writes out possible conflict and requests some other altitude for the collideing aircraft. The colliding aircraft is assumed to be the aircraft with a higher I.D. number.

The new altitudes suggested by the operator are checked until the safe separations are achieved.

In the commands issued to the aircraft there are built in data given to and received from the computer.

If the mentioned process is computer aided, the operator is requested to read in times over the radioemitters for the considered radioemitters and numerated aircraft.

The controller:
- keeps tra of the radioemitter and altitude,
- gives number to the aircraft,
- receives the information form the computer
- issues the commands to the pilot and is unburdened at the same time from the comparison of the various kinds of similar data.

From the previous discussion it is absolutely reasonable to introduce the computers in the case of intensive air traffic.

In order to accomplish this task it would be necessary to implement the suggested program. In that case a big step would have been dane towards a safer flight control.

REFERENCES

[1] Vickers, T. K. and Buckley, J. C., The controller, 14, 5 1975.
[2] Kuśenić, B., Diplomski rad, Saobraćajni studij u Zagrebu, Zagreb, 1975.

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